# Cannot oxygenate, cannot intubate in small children: Urgent need for better data!

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INVITED COMMENTARY

# Cannot oxygenate, cannot intubate in small children

## *Urgent need for better data!*

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This Invited Commentary accompanies the following original article:

Koers L, Janjatovic D, Stevens MF, Preckel B. The emergency paediatric surgical airway. A systematic review. *Eur J Anaesthesiol* 2018; **35**:558–565.

Morbidity and mortality in children is closely matched to difficulties in airway management and has been reported persistently over the years.[1] The perceived 'safety net' of 'front of neck access' to salvage a desperate situation remains engrained in the psyche of the attending clinician. There is, however, very little evidence to support this attitude in small children.

The article by Koers *et al.*[2] in this month's issue of the *European Journal of Anaesthesiology* aims to add evidence to the subject of 'front of neck access' in paediatric practice, by critically evaluating preclinical animal studies performed with either a needle-based or a scalpel-based technique. More specifically, this review only analyses the success of the techniques to gain access to the trachea. It does not address the ability to oxygenate, or indeed to ventilate, following successful needle cannulation or access with a surgical technique.

Fortunately, extreme difficulties with airway management in children are rare and can usually be anticipated. Paediatric airway management is easy in experienced hands in a suitable environment. However, many children are anaesthetised in nonspecialist centres by anaesthetists without regular paediatric practice who may find the 'normal' airways of young children difficult to manage. Therefore, the fact remains that healthy children experience a disproportionate morbidity burden in the peri-operative period due to airway management problems.[3] However, this morbidity can be easily prevented by following simple, locally adaptable algorithms which should include the recognition and treatment of anatomical/mechanical and functional airway obstructions, and recommendations on limiting intubation attempts.[1,4] Following such an algorithm should negate the need for an emergency front of neck access in the otherwise healthy child. On the contrary, functional airway obstructions, the most common reason for a 'cannot ventilate' situation in children are not, or only insufficiently, addressed in paediatric airway algorithms or mainstream paediatric anaesthesia text books. The commonly used term 'cannot intubate, cannot oxygenate' implies that endotracheal intubation or front of neck access has a higher priority than the recognition and treatment of 'simple' oxygenation and ventilation problems, and very little attention is given to the role of respiratory reserves in small children.[4]

Children with significant comorbidities and difficult acquired or congenital airway problems will benefit from the expert care of a trained practitioner in a suitably staffed and supported environment. However, there will be situations in which an unplanned emergency front of neck access is the only chance of survival. These are exceedingly rare – 'a once in a lifetime event' – without any data on its actual frequency and no clinical data in children to guide management.

The ultimate choice (apart from the unlikely timely presence of a skilled rigid bronchoscopist) is between a surgical access and a needle technique. Both techniques carry risks of complications and failure, so one must choose the technique with fewest downsides, but it should be remembered that muscle relaxation is strongly recommended in any age group before attempting such a procedure.[5] The systematic review by Koers *et al.*[2] summarises the options which are based on clinical case

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scenarios and animal models. They included studies that had specific outcome criteria, including time to tracheal access, success rate, complications and perceived ease of use. The results show that for a specialised needle-based technique, which is also recommended in the Association of Paediatric Anaesthetists of Great Britain and Ireland (APAGBI)/Difficult Airway Society (DAS) 2011 guideline,[6] the time to tracheal access via the cricothyroid membrane is faster and has a success rate of around 100%.[7] This simulated success rate, however, is in complete contrast to the actual reported success rate in adults, with only nine of 25 attempts successful when performed in emergency situations: systematic paediatric data unavailable.[5] This uncertainty is further exacerbated when considering the different neck anatomy and compressibility of the airway in childen.[8] Airway dimensions are also critical when accessing the front of the neck. The dimensions of the cricothyroid membrane in neonates were measured at $2.6 \pm$ (SD) 0.7 mm in height by $3 \pm 0.63$ mm in width compared with 9 to 10 mm in adults.[9] This makes insertion of an adequately sized tracheal tube through the cricothyroid membrane impossible.

A surgical technique on the other hand, is slower, still has a complication rate of around 40%, but is successful in nearly nine out of 10 interventions under laboratory conditions using nonhuman, nonpaediatric models and tissues. A surgical technique, however, also allows direct access to tracheal structures which would accommodate available age appropriate endotracheal tubes, inserted either directly, via a bougie or another guide (wire). We should note that this surgical technique was not designed with the paediatric population in mind, but is increasingly popular amongst nonpaediatric anaesthesiologists. It is also consistent with changing attitude amongst paediatric anaesthetists over which technique to use in emergency front of neck access. A recent survey of the members of the APAGBI[10] revealed an increasing number favouring a surgical technique especially in over 1 year olds (52%) and over 8 year olds (73%).

We urgently need evidence on what really works for different age groups. Therefore, at this point, we would like to call for the setup of a suitable paediatric airway registry to capture the success and failures of difficult airway management and front of neck access. Ideally, this registry should be compatible with already existing registries that, due to existing data protection laws, are not globally accessible. 'Safe Haven' analyses of pooled compatible data are the only realistic option to inform this emotional debate with hard data. European and other national societies have a duty to support such projects to research these rare but very important decisions. However, this important data may take some years to collect and, in the meantime, we must continue to evaluate different techniques of gaining emergency access to the trachea, in all ages of children. We must continue to look at the needle approach but also look seriously at surgical techniques which could be taught to the paediatric anaesthetic community.

Most importantly, however, we must continue to focus on the need to prevent emergency front of neck access by implementing the teaching and training of reasonably simple, straightforward paediatric airway algorithms.

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